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Some notes on Western Umbelliferæ. II.

JOHN M. COULTER AND J. N. ROSE.

Eryngium petiolatum Hook. has been made to contain all our Pacific forms, until that species has become a collocation of most dissimilar plants. In our study of this group, the nebulous mass called *E. petiolatum* has been resolved into at least four distinct forms. We have characterized *E. petiolatum* as follows: Erect, 1 to 5 feet high, branching above (or from the base in low forms): radical leaves oblanceolate, spinosely and unequally serrate, attenuate into an elongated fistulose petiole (submerged leaves consisting only of the terete jointed petiole); stem-leaves mostly sessile: involucre bracts linear-lanceolate, spinosely-tipped and toothed (sometimes an inch long), longer than the peduncled globose head; bractlets lanceolate, cuspidate-tipped, scarious-margined below, but little longer than the flowers: calyx-lobes resembling the bractlets, but smaller, much shorter than the long styles.—Mostly in marshes, throughout California (*Greene, Lemmon* 108, *G. R. Vasey* 223 and distributed as var. *armatum*, *Cleveland*, etc.). We have seen no Oregon representative of this species. It varies greatly in size, and in drier places passes into a dwarfed form but 1 to 3 inches high, with all the parts correspondingly reduced (Donner Lake, *C. F. Sonne*).

We would disentangle the following three species from *E. petiolatum*, giving chiefly the points of difference:

Eryngium armatum, n. sp. Diffuse, branching throughout, a foot or so high: serrate to spinose-dentate or incised radical leaves attenuate into a short more or less margined petiole: involucre bracts and bractlets lanceolate (broadest at base), entire (rarely toothed at base), rigid, thick margined, much longer than the head: calyx-lobes acuminate-lanceolate, longer than the short styles.—*E. petiolatum*, var. *armatum* Watson, Bot. Calif. 1. 255.—California, from San Diego to Humboldt and Butte counties. Its range has been extended southward from that given in the Botany of California by *Palmer* 155 (San Luis Obispo) and *Orcutt* (San Diego), as well as to Butte county by *Mrs. R. M. Austin*. In the collections of Pringle, Orcutt, and Mrs. Austin, it was distributed as *E.*

petiolatum, from which it differs in its low, diffuse branching habit, short petioled radical leaves, broad entire rigid bracts and bractlets, all similar and conspicuously longer than the head, and short styles.

Eryngium Vaseyi, n. sp. Stems a foot or less high (sometimes reduced to 2 or 3 inches), several from a common root and branching above: leaves unequally spinulose-serrate, attenuate below: involucre bracts and bractlets narrow, thick and rigid, spinose and spiny-toothed, much longer than the head: calyx-lobes lanceolate, acuminate-cuspidate, longer than the short styles.—In wet ground, California, San Antonio river, July, 1880 (*G. R. Vasey* 222, distributed as *E. petiolatum*), and Chico (*Mrs. R. M. Austin*); S. W. Oregon, near Medford (*Howell*, a much reduced form).—This species is remarkable for its narrow, very spiny bracts and bractlets, much more rigid than in *E. armatum* and spiny-toothed. The calyx-lobes also have stronger cuspidate tips than in that species.

Eryngium articulatum Hook. Erect, 1 or 2 feet high, more or less branching throughout: radical and lower stem-leaves reduced to very long (sometimes a foot long) jointed petioles, with or without a small lanceolate blade (from entire to laciniately toothed): involucre bracts linear, cuspidate-tipped and spiny-toothed (about half-inch long), longer than the head; bractlets tri-cuspidate, the middle one much the largest, scarcely longer than the flowers: calyx-lobes lanceolate, cuspidate-acuminate, hardly longer than the styles.—*E. petiolatum*, var. *juncifolium* Gray, Proc. Am. Acad. viii. 385.—Swamps and wet meadows, Washington Territory, Falcon Valley (*Suksdorf*); Oregon (*Nuttall*, *Hall* 200, *Howell*, *Henderson*); California, Plumas county (*Mrs. R. M. Austin*). Numerous very immature specimens of this species are to be found in herbaria in which the bracts seem very prominent; but it is simply owing to the immaturity of the heads. This is the western representative of the eastern *E. Virginianum* group.¹

Peucedanum Martindalei, n. sp. Resembling *P. Hallii* in

¹ The following species, a member of this group, turns up among Florida collections labeled *E. praealtum* Gray:

E. Floridanum, n. sp. Erect, 2 or 3 feet high, somewhat branching above: lower leaves narrowly oblong (1 to 4 inches long), mostly entire, on long fistulous jointed petioles (sometimes a foot long); upper ones becoming sessile, elongated-linear, usually remotely serrulate: involucre of linear-lanceolate, rigid, sharp-pointed, entire or spiny-toothed, reflexed bracts longer than the subglobose heads; bractlets linear, rigid, entire, tapering to a pungent tip, much longer than the flowers: fruit scaly, with short ovate acute calyx-lobes, and very long rigid styles.—Brackish marshes, Florida, Tampa (*Garber*), and near Jacksonville (*Curtiss*). Distributed as *E. praealtum* Gray, but differing from all species of that group in its entire bractlets.

habit and foliage, but differing in leaves, sometimes bipinnate with toothed or pinnatifid segments; fruit 4 to 7 lines long, $3\frac{1}{2}$ lines broad, with wings much broader than body (which is but a line), and prominent dorsal and intermediate ribs; oil-ducts solitary in the intervals, 2 on the commissural side; and seed-face somewhat concave, with central longitudinal ridge.—Rocky places, Cascade Mountains, Oregon (*Howell*, 1880), flowering in May. Distributed as *P. Hallii*, but differs decidedly in its fruit characters. Dedicated to Mr. I. C. Martindale, to whose collection of Umbelliferæ we are very much indebted.

Var. angustatum. Usually more caulescent and taller, with more dissected leaves, and wings of fruit but half a line wide, making a fruit 2 lines wide.—Oregon, Cascade Mountains (*Howell*), Mt. Paddo (*Suksdorf*); Washington Territory (*Brandegee* 323, *Tweedy* 281); also Vancouver Island, Mount Arrowsmith, alt. 5,500 feet (*Macoun* 19). Also distributed as *P. Hallii*.

Peucedanum Donnellii, n. sp. Shortly caulescent or acaulescent, 6 to 12 inches high, glabrous, from a fusiform root: leaves ternate and then pinnately decompose, with segments pinnately cleft into short oblong or linear lobes: umbel somewhat unequally 6 to 12-rayed, with mostly no involucre, and involucels of linear acuminate bractlets; rays 1 to 4 inches long; pedicels 2 to 8 lines long; flowers yellow: fruit ovate to broadly oblong, glabrous, $3\frac{1}{2}$ to 4 lines long, 2 to 3 lines broad, with wings less than half as broad as body, and prominent dorsal and intermediate ribs: oil-ducts small, 4 to 6 in the intervals, 4 to 6 on the commissural side.—Oregon (*Cusick* 36, in 1883), John Day Valley (*Howell* 829, in 1885). Flowers in April. Most nearly related to *P. Nevadense* Wats. Dedicated to John Donnell Smith, in whose collection the species was first detected.

Peucedanum Californicum, n. sp. Short caulescent, glabrous, with a solitary peduncle rising from 4 inches to a foot high: leaves clustered near the base, large (4 to 6 inches long), bipinnate (the upper leaflets confluent); leaflets broad, obtuse (usually ending truncately or emarginately between two divaricate teeth), irregularly incised and with broad strongly cuspidate teeth: umbel 8 to 10-rayed, with no involucre, and involucels of distinct lanceolate acuminate bractlets; rays 1 to $1\frac{1}{2}$ inches long; pedicels about 3 lines long; flowers yellow: fruit (immature) ovate, glabrous: oil-ducts solitary in the intervals, 2 on the commissural side.—San Luis Obispo,

California, May 5, 1882 (*Marcus E. Jones*). Distributed as *P. parvifolium* T. & G. This is a very distinct species of the *Euryptera* section.

Peucedanum Vaseyi, n. sp. Shortly caulescent, 6 to 8 inches high, pubescent: petioles wholly inflated; leaves small (1 to 2 inches long), bipinnate, with the small ovate segments irregularly 3 to 5-lobed: umbel equally 2 to 5-rayed, with no involucre, and involucels of obovate petiolulate toothed bractlets; rays an inch long; pedicels a line or two long: flowers yellow: fruit broadly oblong, emarginate, glabrous, 6 or 7 lines long, 4 lines broad, with wings twice as broad as body, and prominent dorsal and intermediate ribs: oil-tubes solitary in the intervals, 4 on the commissural side.—San Bernardino Mountains, California, May, 1880 (*G. R. Vasey* 231); mesas, San Bernardino, April, 1881 (*S. B. & W. F. Parish* 286 in part). Distributed by Vasey as *P. macrocarpum* Nutt., var.; and by Parish as *Cymopterus terebinthinus* T. & G.

Selinum Grayi, n. sp. Stout (sometimes very much so), 1 or 2 feet high, glabrous except the more or less scabrous inflorescence, leaf-margins, and veinlets (beneath): leaves once to twice pinnate, with much dilated petioles; leaflets oblong to ovate, about an inch long, acute, toothed (sometimes laciniately-toothed or lobed): umbels with involucels of conspicuous lanceolate-ovate long-acuminate bractlets; rays 1 to two inches long; pedicels 1 to 2 lines long: fruit oblong, glabrous, 2 to 2½ lines long, with prominent thin wings, the lateral ones decidedly broadest: oil-ducts conspicuous: seed dorsally sulcate.—High mountains of Colorado (*Vasey* in 1868, *Canby* in 1871, *Coulter* in 1873, *Trelease* in 1886); also probably *Hall & Harbour* 219 and *Parry* 154. Distributed as *Archangelica* Gmelini, and so called in the *Flora Colorado* and *Coulter's Rocky Mountain Manual*. So far as we have seen all the *Archangelica* Gmelini reported from Colorado is this species. Its general habit resembles that of an *Angelica* somewhat, but its fruit characters are very different, and entirely those of *Selinum*.

Selinum Dawsoni, n. sp. A foot or so high, glabrous: leaves ternate then bipinnate, the small ($\frac{1}{4}$ to $\frac{1}{2}$ inch long) ovate acute segments laciniately toothed to entire: umbels with involucels of linear-oblong scarious bractlets longer than the pedicels and abruptly ending in a long attenuation; pedicels 1 to 2 lines long: fruit oblong, smooth, about 2 lines long, with prominent thin wings, the lateral ones but little broader: oil-ducts conspicuous, rarely an additional small one in a

lateral interval: seed hardly at all dorsally sulcate.—Pelly River, at Pelly Banks, Yukon, lat. 61° , August 11, 1887 (*Dawson* 23). This interesting species is quite distinct from all our *Selinums* in its leaf and involucre characters, as well as in the prominent thin wings of the fruit.

Cœlopleurum Gmelini Ledeb. The range of this species has been confused by referring to it *Selinum Grayi* C. & R. of the Colorado Rocky Mountains. Occurring on the Atlantic coast from Massachusetts Bay to Labrador, we have seen no specimens from the Pacific coast south of Vancouver Island (*Macoun*). It extends from that island to Alaska, and very likely will be found on the coast of Washington Territory and Oregon. We have not discovered that this species is found at all in the interior. In Washington Territory, however, the following coast species has been discovered:

Cœlopleurum maritimum, n. sp. Stem 2 to 3 feet high: leaves 2 to 3-ternate; leaflets broad, often round, usually with cordate base, very obtuse, dentate or crenate-dentate, $2\frac{1}{2}$ to 3 inches long, $2\frac{1}{2}$ inches broad: umbel many-rayed, with involucre of linear-lanceolate bractlets; rays 2 to 3 inches long; pedicels 6 to 7 lines long: fruit oblong, 3 to $3\frac{1}{2}$ lines long, with lateral ribs broadest and seed-face concave.—Wet ocean bluffs, Long Beach, Ilwaco, Washington Territory, July 24, 1886 (*L. F. Henderson* 384).

Ligusticum apiifolium Benth. & Hook. This species is found chiefly in the mountains of Oregon, and extends into California. It is very evident, from a study of herbarium specimens, that it has been much misunderstood; for, while we discover any number of sheets labeled *L. apiifolium*, very few of them prove to be that species. The Oregon plant is represented in the older collections by *Hall* 207, and recently by *Howell* 6 and *Henderson* 1589. The Californian stations are Yosemite valley (*Bolander*), Big Tree road and Ebbett's Pass (*Brewer*), and Donner Lake (*Torrey*). The small oval fruits, smaller than in any other species, with their narrow ribs and reniform seed-section, easily separate it from other *Ligusticums*. Its range, apparently limited to the mountains of Oregon and N. California, serves well to separate it from the Colorado *L. scopulorum*, with which it seems to have been confused.

Ligusticum scopulorum Gray. So far as we can discover, this species does not occur beyond the Rocky Mountains, and chiefly in Colorado. It extends also into N. Arizona (*Palmer* 176, *Rusby* 630). Certain Colorado forms, with im-

mature fruit, referred to this species, differ somewhat in foliage from typical *L. scopulorum*, and simulate *Coniioselinum Canadense* so very closely that mature fruit is necessary to distinguish them. Collectors should carefully note whether any so-called specimens of *L. scopulorum* develop fruit with lateral wings. These wings are often developed so late in the maturing of the fruit that it must be fully ripe before any decision can be made.

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Zygomorphy and its causes. I.

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Since reading a foot-note in Gray's *Structural Botany*¹ referring to the observation of Sprengel, that irregular flowers are adapted to insects, and "that strictly terminal and also vertical flowers, whether erect or suspended, are seldom irregular, while comparatively horizontal or obliquely set flowers more commonly are so," and also referring to the remark of Darwin,² "that he does not know of a single instance of an irregular flower which is wind-fertilized," I have often wondered what are the conditions in the insect relations of horizontal flowers which make advantageous such variations as are in the direction of irregularity. In the observation of the behavior of insects on such flowers I have found answers to some of the questions thus suggested.

Two papers on the causes of zygomorphy have recently appeared, one by Herman Vöchting³ and the other by Frederick Delpino.⁴ My observations approach the subject from a stand-point so different that it is hardly necessary to give more than references to these papers. However, it may be well, by way of introduction, to mention some of the points considered by Delpino; and I am more inclined to do this from the fact that he introduces a few terms which are convenient in characterizing irregular flowers.

Of the causes which are supposed to have operated in the production of floral irregularity Delpino recognizes three categories, viz., the instrumental and mechanical (cause stro-

¹219, note 1.

²Forms of Flowers, 147.

³Ueber Zygomorphie und deren Ursachen. Jahrb. für wissensch. Botanik. Bd. XVII, H. II, 1886, 297-346. See also Bot. Zeit. 1887, 436.

⁴Zigomorfia florale e sue cause, Malpighia, Anno I, Fasc. VI, 1886, 245-262.